PATENT ABSTRACTS OF JAPAN

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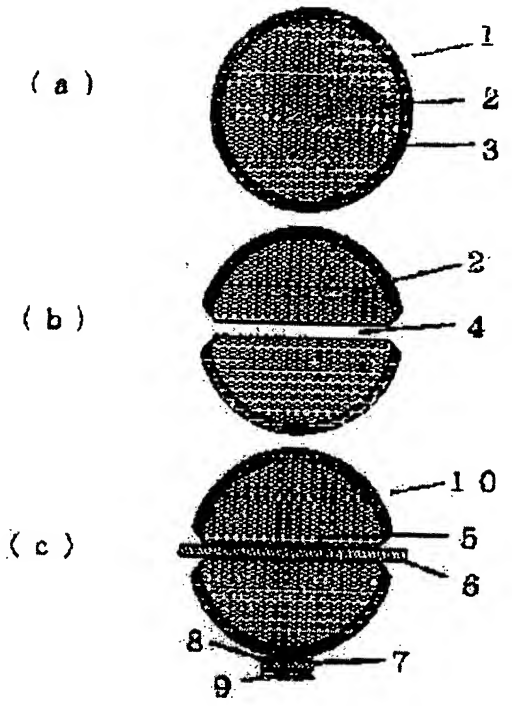
(54) SOLAR BATTERY AND METHOD OF MANUFACTURING IT

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a solar battery for which the electrode of a spheric semiconductor core section can be formed with high productivity by a new continuous means and the light receiving surface of which can be increased by reducing the shaving amount of the spheric semiconductor of the core section and a method of manufacturing the solar battery by which the solar battery can be manufactured and modularized smoothly.
SOLUTION: The solar battery 10 provided with a spheric substrate 1 having a first-conductivity semiconductor carrying a second-conductivity semiconductor on its surface in a core section is constituted in such a way that a through hole 4 is bored through the substrate 1 and an electrode metal 5 is inserted into the hole 4 in a spitting state. Then the metal 5 is bonded to the substrate 1 by forming an alloy layer between the metal 5 and substrate 1 by sintering and a first-conductivity electrode 6 is formed of the protruded part of the metal 5 from the substrate 1.



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CLAIMS

[Claim(s)]
[Claim 1] The solar battery which a breakthrough is opened in said spherical substrate, and food-on-a-skewer insertion of the electrode metal is carried out at this breakthrough in the solar battery which the semi-conductor of the 2nd conductive layer was formed in the front face, and equipped the core section with the spherical substrate with the semi-conductor of the 1st conductivity type, and is characterized by the electrode metal which joined with the alloy with said spherical substrate, and came out of the spherical substrate forming the electrode of the 1st conductivity type.
[Claim 2] The solar battery according to claim 1 characterized by arranging two or more said spherical substrates in the shape of a train, and each spherical substrate being continuously arranged by the breakthrough through the electrode metal which carried out food-on-a-skewer insertion.
[Claim 3] The solar battery according to claim 1 or 2 characterized by the electrode metal with which food-on-a-skewer insertion of the core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type was carried out with spherical silicon or a spherical compound semiconductor at the breakthrough of a spherical substrate being aluminum NYUUMU.
[Claim 4] In the manufacture approach of the solar battery which the semi-conductor of the 2nd conductive layer is formed in a front face, and equips the core section with a spherical substrate with the semi-conductor of the 1st conductivity type A breakthrough is opened and washed to said spherical substrate. An electrode metal to said breakthrough Insertion food on a skewer, The manufacture approach of the solar battery characterized by using as the electrode of the semi-conductor of the 1st conductivity type the electrode metal which forms an alloy layer between said electrode metals and spherical substrates of a penetration pore by sintering, joins, and is by appearance from a spherical substrate.
[Claim 5] In the manufacture approach of the solar battery which the semi-conductor of the 2nd conductive layer is formed in a front face, and equips the core section with a spherical substrate with the semi-conductor of the 1st conductivity type Open a breakthrough in said spherical substrate, and through a wire, continue two or more spherical substrates to a breakthrough, arrange them to it, and they are washed to it. While removing said wire, insert an electrode metal in a breakthrough and two or more spherical substrates are arranged in the shape of a food-on-a-skewer train. The manufacture approach of the solar battery characterized by using as the electrode of the semi-conductor of the 1st conductivity type the electrode metal which has come out of the head or the back end of a spherical substrate which formed the alloy layer between said electrode metals and spherical substrates of a penetration pore by sintering, joined, and was arranged.
[Claim 6] The manufacture approach of the solar battery according to claim 4 or 5 characterized by the electrode metal the core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type carries out [a metal] food-on-a-skewer insertion with spherical silicon or a spherical compound semiconductor at the breakthrough of a spherical substrate being aluminum NYUUMU.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a solar battery and its manufacture approach.
[0002]
[Description of the Prior Art] A spherical semi-conductor is excellent in absorptivity also about the light from which direction, and excellent as a solar battery.
[0003] If light hits, as for a spherical semi-conductor, the pair of an electron (-) and an electron hole (+) will be produced, an electron can be drawn near to a n-type semiconductor, an electron hole can be drawn near to a p type semiconductor, and electromotive force occurs between the n-type semiconductors and p type semiconductors of the both sides of a pn junction part. In order to take out this electromotive force, an electrode is prepared in a n-type semiconductor and a p type semiconductor.
[0004] if the spherical silicon semi-conductor of a core is a p type semiconductor in a spherical semi-conductor, since the n-type semiconductor is conventionally formed in the surface -- the electrode of a p type semiconductor -- some spherical silicon semi-conductors -- etching -- or grinding is carried out, a core is exposed and it forms in this outcrop.
[0005]
[The technical problem which this invention tends to solve] In formation of said electrode, since a spherule moves about, if a part is embedded to resin etc., carry out heating etc., resin is stiffened, a spherical semi-conductor is fixed and said processing to expose is not performed, ******** and production are batch-like and there is a problem that productivity is low.
[0006] Moreover, after exposing said a part of spherule and forming an electrode, processing which removes the resin fixed previously must be carried out, and productivity does not go up from this point, either.
[0007] Furthermore, said exposure processing will remove a part of n-type-semiconductor layer currently formed in the front face of a spherical semi-conductor, and has the problem whose light sensing portion decreases.
[0008] This invention can form the electrode of the core section of a spherical semi-conductor with sufficient productivity with a new continuous means, and it aims at shaving clearance of a spherical semi-conductor obtaining further the solar battery which can take a large light-receiving side few. Moreover, continuous manufacture and the continuous modularization of a solar battery set the manufacture approach which can be done smoothly as other objects.
[0009] In addition, the n-type semiconductor formed in the front face of a spherical semi-conductor is made comparatively easily by the attachment of conductive paste etc. in the electrode.
[0010]
[Means for Solving the Problem] In the solar battery equipped with the spherical substrate which the semi-conductor of the 2nd conductive layer is formed in a front face, and has the semi-conductor of the 1st conductivity type in the core section, a breakthrough is opened in said spherical substrate, and food-on-a-skewer insertion of the electrode metal is carried out at this breakthrough, it joins with an alloy with said spherical substrate, and the summary of this invention is in the solar battery characterized by the electrode metal which came out of the spherical substrate forming the electrode of the 1st conductivity type. The 2nd summary is in the solar battery with which two or more said spherical substrates are arranged in the shape of a train, and each spherical substrate is continuously arranged by the breakthrough through the electrode metal which carried out food-on-a-skewer insertion. The core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type is spherical silicon or a spherical compound semiconductor, and the 3rd summary is in the solar battery characterized by the electrode metal by which

food-on-a-skewer insertion was carried out at the breakthrough of a spherical substrate being aluminum NYUUMU.

[0011] In the manufacture approach of a solar battery that the 4th summary about the manufacture approach of this invention was equipped with the spherical substrate which the semi-conductor of the 2nd conductive layer is formed in a front face, and has the semi-conductor of the 1st conductivity type in the core section A breakthrough is opened and washed to said spherical substrate. An electrode metal to said breakthrough Insertion food on a skewer. An alloy is formed between said electrode metals and spherical substrates of a penetration pore by sintering, and it joins, and is in the manufacture approach of the solar battery characterized by using as the electrode of the semi-conductor of the 1st conductivity type the electrode metal which is by appearance from a spherical substrate. The 5th summary opens a breakthrough in said spherical substrate, and through a wire, continue two or more spherical substrates to a breakthrough, arrange them to it, and it washes them to it. While removing said wire, insert an electrode metal in a breakthrough and two or more spherical substrates are arranged in the shape of a food-on-a-skewer train. An alloy is formed between said electrode metals and spherical substrates of a penetration pore by sintering, and it joins, and is in the manufacture approach of the solar battery characterized by using the electrode metal which has come out of the arranged head or the back end of a spherical substrate as the electrode of the semi-conductor of the 1st conductivity type. The core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type is spherical silicon or a spherical compound semiconductor, and the 6th summary is in the manufacture approach of the solar battery characterized by the electrode metal which carries out food-on-a-skewer insertion being aluminum NYUUMU at the breakthrough of a spherical substrate.

[0012]

[Embodiment of the Invention] Next, one example of this invention is explained with reference to a drawing. Drawing 1 shows manufacture of the solar battery by one example of this invention. 1 is a spherical substrate, and the core section is p mold polycrystalline silicon grain 2 whose diameter is about 1mm, or p mold amorphous silicon ball, and it constitutes the semi-conductor of the 1st conductive layer. It is formed spherically, falling heating in a vacuum, and the semi-conductor 2 of the 1st conductive layer, for example, p mold polycrystalline silicon grain, is formed. n mold polycrystalline silicon layer 3 of the 2nd conductive layer is formed in the front face by the CVD method using mixed gas, such as a silane containing n mold compound dope by the diffusion method, and phosphoretted hydrogen, or ion-implantation.

[0013] A breakthrough 4 is opened in the diameter direction by said spherical substrate 1 by laser, the electron beam, the drill, or the electron discharge method. On both sides of the spherical substrate 1, it pinches and fixes with a fixture, or punching of this breakthrough 4 is put in in a tube, is held, and is continuously made by this spherical substrate 1 with the exposure of laser and an electron beam, or a drill.

[0014] As shown in the inlet port and outlet of a breakthrough 4 at (b) of drawing 1 in the case of punching of said breakthrough 4, it is desirable although it is made for n mold polycrystalline silicon layer 3 of said surface not to connect with the electrode metal with which giving before formation of a breakthrough 4 or after formation inserts taper processing in this breakthrough 4 too hastily.

[0015] a prevention of said short circuit sake -- (a) of not only said taper processing but drawing 2 -- like -- n mold polycrystalline silicon layer 3 of the inlet port of a breakthrough 4, and an outlet -- the shape of direct -- cutting off -- or (b) of this drawing -- like -- the inlet port of a breakthrough 4, and n mold polycrystalline silicon layer 3 of the outlet section -- the aperture of a drill, and the exposure light diameter of laser -- extending -- etc. -- what is necessary is just to remove width

[0016] the spherical substrate 1 with which the breakthrough 4 was punched is washed -- having -- lines, such as the electrical conduction metal 5, for example, aluminum NYUUMU, and an aluminum NYUUMU alloy, -- the insertion food on a skewer of the body is carried out to a breakthrough 4. Since the part which comes out of the spherical substrate 1 by food on a skewer serves as an electrode 6, the food on a skewer of the electric conduction metal 5 is carried out so that it may come out of the die-length spherical substrate 1 required for an electrode 6. Said desirable electric conduction metal 5 is aluminum NYUUMU when the core section of the spherical substrate 1 is silicon.

[0017] Before inserting said electrical conduction metal 5 in a breakthrough 4, the electric conduction metal 4 concerned is cooled, a cooling contraction condition is used, and you may make it raise immobilization in a breakthrough 4 by returning to ordinary temperature after insertion.

[0018] Sintering is carried out at 300-350 degrees C with heating apparatus, you make it mutually spread with said electrical conduction metal 5 and spherical substrate 1 of a penetration pore, an alloy layer is formed, and the spherical substrate 1 with which the insertion food on a skewer of the electrical conduction metal 5 was carried out is joined. The electrical conduction metal 5 which has come out of the

spherical substrate 1 by this can function now as a p mold electrode in an electrode 6 and this example.
[0019] In addition, n mold electrode 7 of n mold polycrystalline silicon layer 3 of the 2nd conductivity type is formed on the electric conduction plate 8 which laid the spherical substrate 1 and was joined. In addition, 9 is the insulating material formed in the underside of said electric conduction plate 8.
[0020] Thus, although the solar battery 10 which consists of a spherical semi-conductor by this invention is manufactured, the electrode 6 of the core section of a spherical semi-conductor can be formed with sufficient productivity, without carrying out troublesome routings, such as resin immobilization and its clearance.
[0021] Next, the spherical substrate 1 of the 2nd example is explained about the solar battery which continued and was arranged, and its manufacture with reference to drawing 3 , drawing 4 , drawing 5 , drawing 6 , drawing 7 , and drawing 8 . [two or more] The spherical substrate 1 is manufactured like a previous example, n mold polycrystalline silicon 3 is formed in a surface layer, and the core section is p mold polycrystalline silicon grain 2.
[0022] Pinching immobilization is carried out with the clip fixture 11 like drawing 3 , and the spherical substrate 1 drills a breakthrough 4 in this spherical substrate 1 by laser, the electron beam, the drill, or the electron discharge method. As the previous example described on the occasion of drilling of this breakthrough 4, it is desirable to form a taper etc. in an inlet port and an outlet.
[0023] The punched spherical substrate 1 is extruded in the cylinder 12 shown in drawing 4 from the clip fixture 11, the support wire 13 prepared in this cylinder 12 goes into said breakthrough 4, and the request number column of the punched spherical substrate 1 is carried out through the support wire 13 one by one. What continued letting the spherical substrate 1 pass to drawing 5 , and arranged it in this example to it at four pieces and the support wire 13 is shown. In addition, the number of an array is changed not only according to four pieces but according to the object.
[0024] Said spherical substrate 1 by which two or more arrays were carried out is washed, and a part for adhesion powder or liquid etc. is removed. Then, while removing said support wire 13, as shown in drawing 6 , the insertion food on a skewer of the electrical conduction metal 5, for example, aluminum NYUUMU, the aluminum NYUUMU alloy, etc. is carried out to a breakthrough 4. In addition, 14 stops the spherical substrate 1 of the head by which food on a skewer was carried out by the stopper.
[0025] Subsequently, sintering is made like the above with heating apparatus, the electrical conduction metal 5 and the spherical substrate 1 of the breakthrough 4 section form an alloy layer, and join said two or more spherical substrates 1 by which food on a skewer was carried out, and the electrical conduction metal 5 which has come out of the spherical substrate 1 serves as an electrode of p mold polycrystalline silicon grain 2 in this example. Thus, by this invention, the electrode of the core section of the arranged spherical substrate 1 is formed at few new processes.
[0026] As the single tier shows the spherical substrate 1 which the electrode of the core section was formed and were arranged to drawing 7 , or as it is shown in drawing 8 as desired two or more trains, it is placed on the electric conduction plate 15, and said electric conduction plate 15 which is in contact with n mold polycrystalline silicon layer 3 of the surface of the spherical substrate 1 serves as the electrode 16 of a n-type semiconductor. In addition, the insulating material 17 is formed in the underside of the electric conduction plate 15.
[0027] If a polyimide film [SHIBIRIITI flexibly as said insulating material 17] etc. is used, it comes to be able to perform processing processing of a subsequent modularization by the reel two reel.
[0028] Thus, by this invention, it can manufacture with sufficient productivity at few processes, without the solar battery arranged in the spherical substrate carrying out resin immobilization, its clearance, etc. as well as the above. [two or more]
[0029] Although the core section of a spherical substrate stated the n-type semiconductor or the thing by which it was formed to a p type semiconductor and the surface section in said example, not only this but the core section can apply this invention similarly, even if a p type semiconductor is formed in a n-type semiconductor and the surface section.
[0030]
[Effect of the Invention] Since it seems that shave off a spherule and it is not made for the spherical substrate by this invention to form the electrode of the core section, the solar battery which can take a large light sensing portion is obtained. Moreover, there is effectiveness of a solar battery being manufactured with sufficient productivity as mentioned above.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to a solar battery and its manufacture approach.

[Translation done.]

PRIOR ART

[Description of the Prior Art] A spherical semi-conductor is excellent in absorptivity also about the light from which direction, and excellent as a solar battery.
[0003] If light hits, as for a spherical semi-conductor, the pair of an electron (-) and an electron hole (+) will be produced, an electron can be drawn near to a n-type semiconductor, an electron hole can be drawn near to a p type semiconductor, and electromotive force occurs between the n-type semiconductors and p type semiconductors of the both sides of a pn junction part. In order to take out this electromotive force, an electrode is prepared in a n-type semiconductor and a p type semiconductor.
[0004] if the spherical silicon semi-conductor of a core is a p type semiconductor in a spherical semi-conductor, since the n-type semiconductor is conventionally formed in the surface -- the electrode of a p type semiconductor -- some spherical silicon semi-conductors -- etching -- or grinding is carried out, a core is exposed and it forms in this outcrop.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] Since it seems that shave off a spherule and it is not made for the spherical substrate by this invention to form the electrode of the core section, the solar battery which can take a large light sensing portion is obtained. Moreover, there is effectiveness of a solar battery being manufactured with sufficient productivity as mentioned above.

[Translation done.]

TECHNICAL PROBLEM

[The technical problem which this invention tends to solve] In formation of said electrode, since a spherule moves about, if a part is embedded to resin etc., carry out heating etc., resin is stiffened, a spherical semi-conductor is fixed and said processing to expose is not performed, ******** and production are batch-like and there is a problem that productivity is low.
[0006] Moreover, after exposing said a part of spherule and forming an electrode, processing which removes the resin fixed previously must be carried out, and productivity does not go up from this point, either.
[0007] Furthermore, said exposure processing will remove a part of n-type-semiconductor layer currently formed in the front face of a spherical semi-conductor, and has the problem whose light sensing portion decreases.
[0008] This invention can form the electrode of the core section of a spherical semi-conductor with sufficient productivity with a new continuous means, and it aims at shaving clearance of a spherical semi-conductor obtaining further the solar battery which can take a large light-receiving side few. Moreover, continuous manufacture and the continuous modularization of a solar battery set the manufacture approach which can be done smoothly as other objects.
[0009] In addition, the n-type semiconductor formed in the front face of a spherical semi-conductor is made comparatively easily by the attachment of conductive paste etc. in the electrode.

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MEANS

[Means for Solving the Problem] In the solar battery equipped with the spherical substrate which the semi-conductor of the 2nd conductive layer is formed in a front face, and has the semi-conductor of the 1st conductivity type in the core section, a breakthrough is opened in said spherical substrate, and food-on-a-skewer insertion of the electrode metal is carried out at this breakthrough, it joins with an alloy with said spherical substrate, and the summary of this invention is in the solar battery characterized by the electrode metal which came out of the spherical substrate forming the electrode of the 1st conductivity type. The 2nd summary is in the solar battery with which two or more said spherical substrates are arranged in the shape of a train, and each spherical substrate is continuously arranged by the breakthrough through the electrode metal which carried out food-on-a-skewer insertion. The core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type is spherical silicon or a spherical compound semiconductor, and the 3rd summary is in the solar battery characterized by the electrode metal by which food-on-a-skewer insertion was carried out at the breakthrough of a spherical substrate being aluminum NYUUMU.
[0011] In the manufacture approach of a solar battery that the 4th summary about the manufacture approach of this invention was equipped with the spherical substrate which the semi-conductor of the 2nd conductive layer is formed in a front face, and has the semi-conductor of the 1st conductivity type in the core section A breakthrough is opened and washed to said spherical substrate. An electrode metal to said breakthrough Insertion food on a skewer, An alloy is formed between said electrode metals and spherical substrates of a penetration pore by sintering, and it joins, and is in the manufacture approach of the solar battery characterized by using as the electrode of the semi-conductor of the 1st conductivity type the electrode metal which is by appearance from a spherical substrate. The 5th summary opens a breakthrough in said spherical substrate, and through a wire, continue two or more spherical substrates to a breakthrough, arrange them to it, and it washes them to it. While removing said wire, insert an electrode metal in a breakthrough and two or more spherical substrates are arranged in the shape of a food-on-a-skewer train. An alloy is formed between said electrode metals and spherical substrates of a penetration pore by sintering, and it joins, and is in the manufacture approach of the solar battery characterized by using the electrode metal which has come out of the arranged head or the back end of a spherical substrate as the electrode of the semi-conductor of the 1st conductivity type. The core section of the spherical substrate which forms the semi-conductor of said 1st conductivity type is spherical silicon or a spherical compound semiconductor, and the 6th summary is in the manufacture approach of the solar battery characterized by the electrode metal which carries out food-on-a-skewer insertion being aluminum NYUUMU at the breakthrough of a spherical substrate.
[0012]
[Embodiment of the Invention] Next, one example of this invention is explained with reference to a drawing. Drawing 1 shows manufacture of the solar battery by one example of this invention. 1 is a spherical substrate, and the core section is p mold polycrystalline silicon grain 2 whose diameter is about 1mm, or p mold amorphous silicon ball, and it constitutes the semi-conductor of the 1st conductive layer. It is formed spherically, falling heating in a vacuum, and the semi-conductor 2 of the 1st conductive layer, for example, p mold polycrystalline silicon grain, is formed. n mold polycrystalline silicon layer 3 of the 2nd conductive layer is formed in the front face by the CVD method using mixed gas, such as a silane containing n mold compound dope by the diffusion method, and phosphoretted hydrogen, or ion-implantation.
[0013] A breakthrough 4 is opened in the diameter direction by said spherical substrate 1 by laser, the electron beam, the drill, or the electron discharge method. On both sides of the spherical substrate 1, it pinches and fixes with a fixture, or punching of this breakthrough 4 is put in in a tube, is held, and is

continuously made by this spherical substrate 1 with the exposure of laser and an electron beam, or a drill.

[0014] As shown in the inlet port and outlet of a breakthrough 4 at (b) of drawing 1 in the case of punching of said breakthrough 4, it is desirable although it is made for n mold polycrystalline silicon layer 3 of said surface not to connect with the electrode metal with which giving before formation of a breakthrough 4 or after formation inserts taper processing in this breakthrough 4 too hastily.
[0015] a prevention of said short circuit sake -- (a) of not only said taper processing but drawing 2 -- like -- n mold polycrystalline silicon layer 3 of the inlet port of a breakthrough 4, and an outlet -- the shape of direct -- cutting off -- or (b) of this drawing -- like -- the inlet port of a breakthrough 4, and n mold polycrystalline silicon layer 3 of the outlet section -- the aperture of a drill, and the exposure light diameter of laser -- extending -- etc. -- what is necessary is just to remove width
[0016] the spherical substrate 1 with which the breakthrough 4 was punched is washed -- having -- lines, such as the electrical conduction metal 5, for example, aluminum NYUUMU, and an aluminum NYUUMU alloy, -- the insertion food on a skewer of the body is carried out to a breakthrough 4. Since the part which comes out of the spherical substrate 1 by food on a skewer serves as an electrode 6, the food on a skewer of the electric conduction metal 5 is carried out so that it may come out of the die-length spherical substrate 1 required for an electrode 6. Said desirable electric conduction metal 5 is aluminum NYUUMU when the core section of the spherical substrate 1 is silicon.
[0017] Before inserting said electrical conduction metal 5 in a breakthrough 4, the electric conduction metal 4 concerned is cooled, a cooling contraction condition is used, and you may make it raise immobilization in a breakthrough 4 by returning to ordinary temperature after insertion.
[0018] Sintering is carried out at 300-350 degrees C with heating apparatus, you make it mutually spread with said electrical conduction metal 5 and spherical substrate 1 of a penetration pore, an alloy layer is formed, and the spherical substrate 1 with which the insertion food on a skewer of the electrical conduction metal 5 was carried out is joined. The electrical conduction metal 5 which has come out of the spherical substrate 1 by this can function now as a p mold electrode in an electrode 6 and this example.
[0019] In addition, n mold electrode 7 of n mold polycrystalline silicon layer 3 of the 2nd conductivity type is formed on the electric conduction plate 8 which laid the spherical substrate 1 and was joined. In addition, 9 is the insulating material formed in the underside of said electric conduction plate 8.
[0020] Thus, although the solar battery 10 which consists of a spherical semi-conductor by this invention is manufactured, the electrode 6 of the core section of a spherical semi-conductor can be formed with sufficient productivity, without carrying out troublesome routings, such as resin immobilization and its clearance.
[0021] Next, the spherical substrate 1 of the 2nd example is explained about the solar battery which continued and was arranged, and its manufacture with reference to drawing 3 , drawing 4 , drawing 5 , drawing 6 , drawing 7 , and drawing 8 . [two or more] The spherical substrate 1 is manufactured like a previous example, n mold polycrystalline silicon 3 is formed in a surface layer, and the core section is p mold polycrystalline silicon grain 2.
[0022] Pinching immobilization is carried out with the clip fixture 11 like drawing 3 , and the spherical substrate 1 drills a breakthrough 4 in this spherical substrate 1 by laser, the electron beam, the drill, or the electron discharge method. As the previous example described on the occasion of drilling of this breakthrough 4, it is desirable to form a taper etc. in an inlet port and an outlet.
[0023] The punched spherical substrate 1 is extruded in the cylinder 12 shown in drawing 4 from the clip fixture 11, the support wire 13 prepared in this cylinder 12 goes into said breakthrough 4, and the request number column of the punched spherical substrate 1 is carried out through the support wire 13 one by one. What continued letting the spherical substrate 1 pass to drawing 5 , and arranged it in this example to it at four pieces and the support wire 13 is shown. In addition, the number of an array is changed not only according to four pieces but according to the object.
[0024] Said spherical substrate 1 by which two or more arrays were carried out is washed, and a part for adhesion powder or liquid etc. is removed. Then, while removing said support wire 13, as shown in drawing 6 , the insertion food on a skewer of the electrical conduction metal 5, for example, aluminum NYUUMU, the aluminum NYUUMU alloy, etc. is carried out to a breakthrough 4. In addition, 14 stops the spherical substrate 1 of the head by which food on a skewer was carried out by the stopper.
[0025] Subsequently, sintering is made like the above with heating apparatus, the electrical conduction metal 5 and the spherical substrate 1 of the breakthrough 4 section form an alloy layer, and join said two or more spherical substrates 1 by which food on a skewer was carried out, and the electrical conduction metal 5 which has come out of the spherical substrate 1 serves as an electrode of p mold polycrystalline silicon grain 2 in this example. Thus, by this invention, the electrode of the core section of the arranged spherical substrate 1 is formed at few new processes.

[0026] As the single tier shows the spherical substrate 1 which the electrode of the core section was formed and were arranged to drawing 7 , or as it is shown in drawing 8 as desired two or more trains, it is placed on the electric conduction plate 15, and said electric conduction plate 15 which is in contact with n mold polycrystalline silicon layer 3 of the surface of the spherical substrate 1 serves as the electrode 16 of a n-type semiconductor. In addition, the insulating material 17 is formed in the underside of the electric conduction plate 15.

[0027] If a polyimide film [SHIBIRIITI flexibly as said insulating material 17] etc. is used, it comes to be able to perform processing processing of a subsequent modularization by the reel two reel.

[0028] Thus, by this invention, it can manufacture with sufficient productivity at few processes, without the solar battery arranged in the spherical substrate carrying out resin immobilization, its clearance, etc. as well as the above. [two or more]

[0029] Although the core section of a spherical substrate stated the n-type semiconductor or the thing by which it was formed to a p type semiconductor and the surface section in said example, not only this but the core section can apply this invention similarly, even if a p type semiconductor is formed in a n-type semiconductor and the surface section.

[Translation done.]

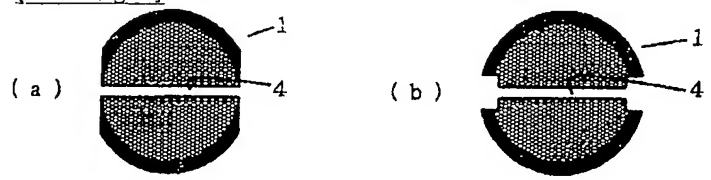
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing showing manufacture of the solar battery by one example of this invention.
[Drawing 2] Drawing showing the formation configuration of the breakthrough to the spherical substrate in one example of this invention.
[Drawing 3] Drawing for explaining formation of the breakthrough to the spherical substrate by the 2nd example of this invention.
[Drawing 4] Drawing for explaining the manufacture process of the solar battery by the 2nd example of this invention.
[Drawing 5] Drawing for explaining the manufacture process of the solar battery by the 2nd example of this invention.
[Drawing 6] Drawing showing the solar battery by the 2nd example of this invention.
[Drawing 7] Drawing showing the solar battery of 1 train array of the spherical substrate by the 2nd example of this invention.
[Drawing 8] Drawing showing the solar battery of two or more trains array of the spherical substrate by the 2nd example of this invention.
[Description of Notations]
1 Spherical Substrate
2 P Mold Polycrystalline Silicon Grain
3 N Mold Polycrystalline Silicon Layer
4 Breakthrough
5 Electrical Conduction Metal
6 Electrode
7 N Mold Electrode
8 Electric Conduction Plate
9 Insulating Material
10 Solar Battery
11 Clip Fixture
12 Cylinder
13 Support Wire
14 Stopper
15 Electric Conduction Plate
16 Electrode
17 Insulating Material

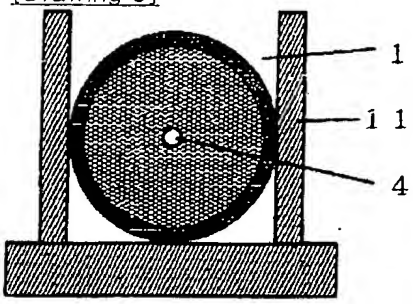
[Translation done.]

DRAWINGS

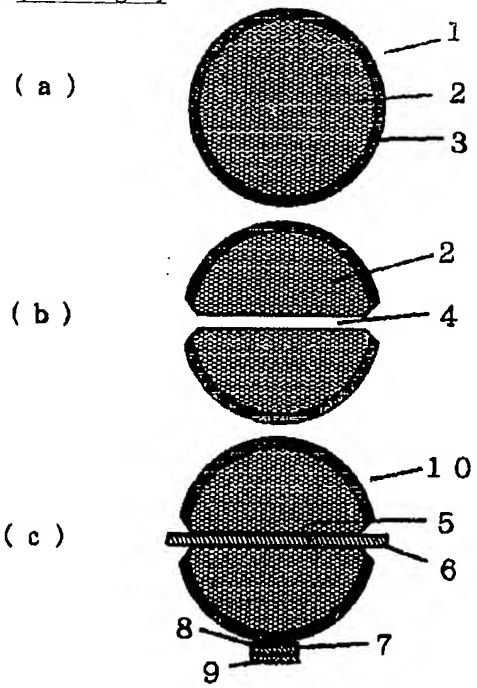
[Drawing 2]



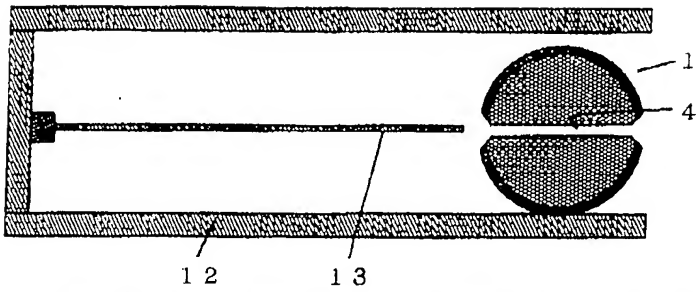
[Drawing 3]



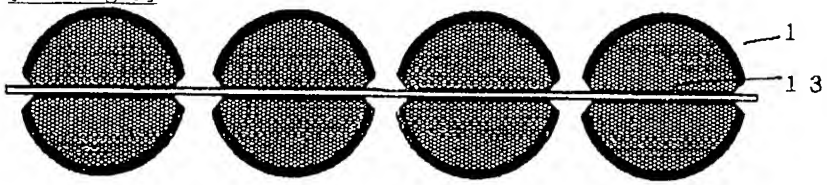
[Drawing 1]



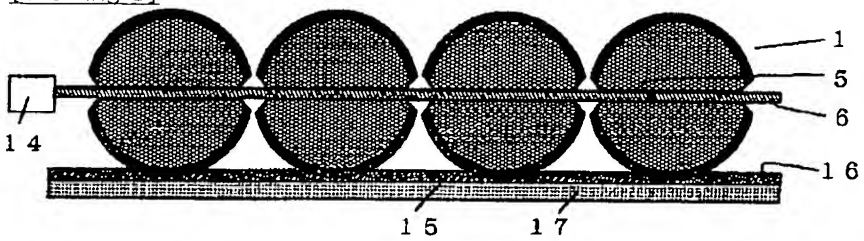
[Drawing 4]



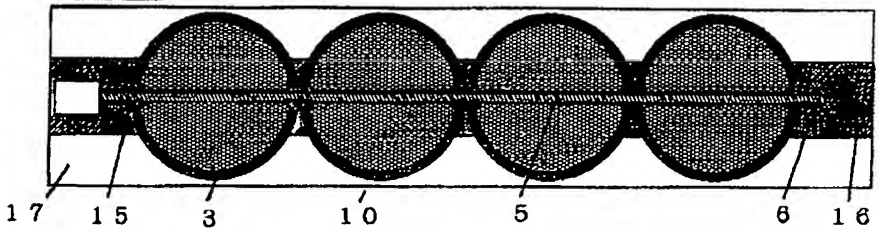
[Drawing 5]



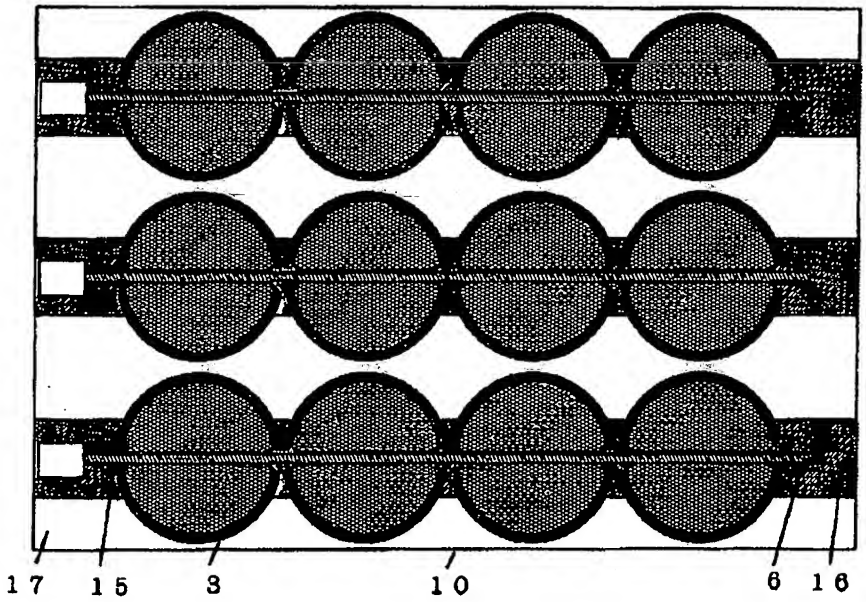
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]